

Investigating the Enabling Factors That Influence Online Shoppers When Adopting Intelligent Personal Assistant (IPA): Case of Saudi's users

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Abstract

With Intelligent Personal Assistants (IPAs) integration in smartphones and tablets, population increase, and industrial growth, using IPA has the opportunity of becoming popular in Saudi Arabia. There are scientific reviews that explain its significant impact and possible opportunities when adopting IPAs in the e-commerce area. This technology may better understand the needs of the users. However, few scholarly studies focused on evaluating the usage of IPAs for online shopping and there is a lack of information about the users' needs. Additionally, there are no studies relating to the adoption and usability of the IPA regarding Saudi Arabia users. For those reasons, this research aims to understand Saudi online shoppers' needs when adopting IPA for online shopping by examining enabling factors impacting IPA adoption. The study modified the UTAUT model to develop assumptions and used a user experience evaluation as a method to test the hypothesis. The data captured using a questionnaire and been analyzed statically using SEM and MMR. The results show the performance expectancy is the most significant factor, followed by the visual attractiveness. The performance expectancy is enhanced by the information relevance and perceived security factors. However, effort expectancy and facilitating conditions have no significant influence on the behavioral intention to adopt an IPA for e-shopping in Saudi Arabia.

Keywords: *Intelligent Personal Assistant, IPA, UTAUT, SEM, e-commerce, AI, HCI, Virtual assistants, User Experience.*

1. Introduction

There is a range of Artificial Intelligence (AI) that is being developed within the market presently, and one in every of that has gradually gained its presence is that the Intelligent Personal Assistant (IPA) [1]. IPA is sometimes referred to as Conversational Agents, Virtual Assistants, or Voice Personal Assistants which are software agents that run on smart devices like Apple's Siri, Google's assistant, and Microsoft's Cortana. Those assistants are conversational agents programmed within Artificial Intelligence which can receive voice or textual commands, responses, and create interaction through a natural language used in digital communication [2]. IPAs are almost available on any smartphone platform and in different languages. These software agents are learning and adapting user speech patterns, what users prefer, and contexts over time because of the advancement of machine learning [1]. AI can be defined as "the study of the agents

that receive percepts from the environment and perform actions" [3]. IPA acts using AI via Natural Language Processing (NLP) to combine human learning and machine reasoning [2]. Some IPA now can order, accept payments and complete the delivery as for example Alexa [4], and Google Assistant [5], [6]. Market brands are looking for more ways to engage customers and for them using IPA is an opportunity [1]. A study [7] pointed out that this technology may better understand the needs of the users. Also, yield the capability of analyzing the inputs and data derived from the conversations with assistants. To maintain the business environment, opportunities should be seized through adopting innovative technology and innovative business models, e-commerce organizations and firms can provide solutions to engage consumers, improving customer lifecycle and purchasing experiences, offer consumer-optimized production, and facilitate the growth of digital businesses [8]. IPA in e-commerce can provide insights for firms relating to shoppers' wishes and needs, which includes their purchasing process and context [7], [9]. However, there are still some concerns about the security and privacy dangers, and misunderstandings possible when using voice commands [10]. In addition, the market investment of IPA for commercial activities is still limited, and some e-shopping services distributed within familiar IPAs as Google's Assistant are limited and not supported in some global regions [11]. A theoretical understanding of what influences users to adopt IPA for electronic shopping is still in its infancy. Evaluating the usage of IPAs for online shopping and concentrating on users is essential in the case of developing assistants for online marketing and e-commerce purposes [7], [12].

There is a lack of information about the adoption and usability of IPA regarding the Kingdom of Saudi Arabia users. In addition, due to IPAs integration with smartphones and tablets, population increase, and industrial growth, using IPA has the opportunity of becoming popular in the Kingdom [18]. For those reasons, this research aims to understand Saudi citizens' online shoppers' needs when adopting IPA to search or purchase a product over the Internet by examining enabling factors impacting IPA adoption using an experimental evaluation to evaluate user experience. The research question

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intended to be solved is: (What enabling factors influence Saudis when adopting IPA for searching or buying products over the internet?). The objectives are to (1) develop a theoretical framework that represents the hypothesized relationship between factors with the use of the UTAUT, (2) perform a user experience evaluation of using IPA for shopping online to test the hypotheses, (3) analyze and measure the factors influence on the adoption of the IPA regarding Saudi users, and lastly to (4) state or describe relationships between the factors and IPA adoption.

2. Literature Review

2.1 The E-Commerce in Saudi Arabia

Before reviewing e-commerce's recent situation in Saudi Arabia, first, it is better to introduce the Kingdom of Saudi Arabia (KSA). In brief, KSA is an Arab, Islamic, developing, and oil-exporting country. It is located in southwestern Asia and most of the residents are Arab Muslims [19]. The main currency is Saudi Riyal. The population reaches 33.7 million in 2018 [20] [21].

Recently, the Middle East has been experiencing a growth in e-commerce. A report published by Statista Research Department in 2020, showed the market capitalization of the e-commerce industry in Saudi Arabia was approximately 3 billion U.S. dollars in 2017 and increased to approximately 6.7 billion dollars in 2020 during the COVID-19 pandemic. It is also expected to continue raising and thus reaching about 8 billion U.S. dollars in 2024 [22]. Also, they reported that Saudi Internet users are gradually on the rise and reached 28.8 million in 2019 [23]. The General Authority for Statistics (GASTAT) Releases a Report declared that young Saudis of the age group (15-34 years) represent 36.7% of the total Saudi population, and the percentage of children and youth in the Saudi population in 2020 represents 67% [24], and the young adults of Saudi are more familiar with commerce electronic mediums [25]; also it is expected from the new generations to get used to using modern technologies in future. Therefore, since the people who are familiar with technology have the largest share of the Kingdom's population, there are positive expectations towards improving e-commerce returns even more.

2.2 Intelligent personal assistant

Intelligent personal assistants (IPAs) are digital language-based assistants that combine powerful algorithms and comprehensive databases. As mentioned before, intelligent assistants are software agents based on AI technology that can receive voice or textual commands and run on smart devices like Apple's Siri, Google's assistant, and Microsoft's Cortana. Some are standalone technology that takes the form of a smart speaker such as Amazon's Alexa. Every IPA has individual characteristics

or features, whether related to appearance (e.g. voice tones, user interface...) or to the way they do the task. The appearance of an IPA can vary in the user interface and depending on whether it supports the voice and textual based users' queries, or only supports the voice commands and responses. IPAs such as Google's Assistant support voice and textual-based commands and responses, and it can show different media such as text, pictures, videos, and voices as a response. In addition to that, Google's Assistant support different user interface display features such as menu lists, search box, query suggestions, and it displays some routine information on its homepage that user can personalize. Despite the differences between the IPAs, their core functionalities are the same. Examples of some of these functionalities are, sending and reading messages, setting alarm and calendar entries, answering basic informational queries, controlling Internet-of-Things-enabled devices, telling jokes and stories, controlling media playback from connected services such as Amazon, Google Play, iTunes, Netflix, and so on [26]. Due to the ability to have a conversation through voice, it is considered to be a fast and convenient way to command and perform things remotely through IoT and AI. With the increase in performance of the algorithms used and with data availability, dialogs can become more intelligent. The technical basis for this is provided by conversational AI platforms. Voice identification (or recognition) of the user is distinguished through the processing of natural language (NLP) and speaker recognition or speaker verification which is focused on the identification of a person based on the characteristics of a voice. The capability of answering a search query by an IPA also depends on the usability and the capabilities of the application [2], [10]. This study focused on the IPAs that run on smart mobiles and are capable of receiving and sending voice and textual commands and information about product search from the users to study certain related factors such as (Information relevance and Visual Attractiveness).

3. The Theoretical Framework and Hypothesis

This research studies the HCI science area of an e-commerce shopping method (using IPA) that is aided by advanced technologies like AI and NLP. The technology adoption study area is one of the extensively researched areas in the information system (IS) domain [40]. The technology acceptance model (TAM) [41] and the unified theory of acceptance and use of technology (UTAUT) are two of the common theories that have been used to study user adoption of IS and IT [40], [42].

3.1 The UTAUT

The unified theory of acceptance and use of technology was developed by Venkatesh in 2003 [43]. The UTAUT suggests that four independent variables

(Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions) are direct determinants of (Behavioral Intention) and the ultimate behavior toward a product, and these independent variables are in turn moderated by gender, age, experience, and voluntariness of use [43]. The theory integrated eight predominant theories and models, including: TRA, TAM, IDT, SCT, TPB, the Motivational Model, a combined TBP/TAM, and the Model of PC Utilization [43]. UTAUT has been compared to the previous eight models individually and it outperformed them all with an adjusted R^2 of 69 percent [44]. Moreover, a Comparison study of existing technology acceptance theories and models [45] revealed UTAUT is one of the most popular technology acceptance theories that is being used mainly in IS literature. It is noted that moderators can play a significant role in the explanatory ability of the theories and models. Therefore, against the other models, UTAUT is the only one that considers age, gender and experience together as moderate factors. This is what makes it more convenient in the explanatory ability in explaining behavioral intention and usage of technology. According to [45] conclusion, UTAUT provides a solid base to expound on why users accept or reject technology from a specific perspective.

3.2 The Hypothesis Development

Based on the UTAUT model, this study assumes that (Performance Expectancy (PE), Effort Expectancy (EE), and Facilitating Conditions (FC)) are independent variables that could be a direct determinant of (Behavioral Intention (BI)) toward the usage of IPA for e-shopping along with the (Visual Attractiveness (VA)) as an independent variable. In addition, this study assumes that (Information Relevance (IR), and Perceived Security (PS)) are indirect determinants. With the consideration of the moderated variables (Gender, Age, Previous Experience).

While developing the model for this study, the Social Influence as an independent variable from the UTAUT has been discarded and rather focused respectively on Visual Attractiveness, Information Relevance, and Perceived Security. In order to limit the area of HCI factors to Information System and Technology field aspects.

3.2.1 Behavioral Intention

Behavioral Intention is defined as the degree of the acceptance behavior of using the targeted technology [30]. It will help determine the enabling factors in which the independent variables will positively affect the behavioral intention to use the IPA for online shopping, where BI is considered the main dependent variable in the UTAUT model.

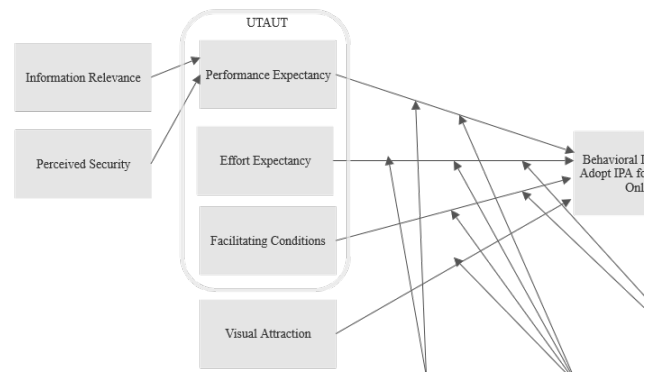


Fig. 1 The Proposed research model.

3.2.2 Performance Expectancy

Performance Expectancy: “is the degree to which an individual believes that the system helps to improve job performance” [30]. It has been considered the strongest predictor of the behavioral intention to use the technology [30]. In the context of the adoption of smart speakers for shopping online [33], the most important smart speaker system function is the voice recognition capability. The most significant and substantial factor influencing the willingness of German, the U.S. and U.K. online shoppers to use voice assistants is the performance expectancy [34]. To lead to a strong B2C engagement relationship, IPA needs to be useful and easy to use for e-shopping activities [1]. The perceived usefulness of an IPA has significant effects on individuals’ behavioral intention to adopt the IPA [15]. According to a research result [17], the consideration of the process efficiency of voice commerce in terms of overall searching and buying process speed and the number of steps to accomplish a task is recommended. In the context of Saudi customers’ continued intention toward adoption of mobile commerce, perceived usefulness has a significant impact [35]. Therefore, this study referred to PE as the users’ perception of the usefulness of using IPA for shopping online, whether it enhances their shopping performance through a conversation (textual and voice commands) and the perception of the speed in job performance, and ultimately enable IPA adoption for online shopping.

H1: PE has a positive influence on BI to use IPA for e-shopping.

3.2.3 Effort expectancy

Effort expectancy is referred to as “the degree of ease associated with the use of the system.” [30]. In other words, EE represents the user’s beliefs regarding the ease of use of technology. It is an important predictor included in a lot of technology acceptance and adoption conceptual models in research articles such as the adoption of mobile

payment [36], multi-screen tools [37], Autonomous Vehicles [38]. Smart voice recognition and NLP technologies are still in the early stages of adoption and many people have limited experience in using such technologies [34]. This is an impulsion to test whether the EE factor may be influencing behavioral intent or not.

In the context of IPA adoption, a previous study [15] found a positive impact of ease of use on the behavioral intention to adopt IPA. [1] also stated that to benefit from integrating new technologies such as an IPA for searching products and decision-making aid while shopping, the voice assistant needs to be useful and easy to use. According to [17], voice commerce system features are easier to use and take less effort compared to other e-commerce systems. Effort expectancy has an influence on behavioral intention in the US in the context of using a voice intelligent personal assistant for online shopping [39]. Existed IPA solutions have different user interfaces, some combine voice recognition with text-based commands such as Google assistance, others only voice-based as Siri, and some exist as speakers such as Alexa. Every type of IPA has different queries that it can accept and respond to, different shopping services, and different ways to apply the queries. Especially complex online shopping tasks, such as product comparisons. Thus, this study represents EE as the user's beliefs regarding the ease of use of an IPA for e-shopping, including whether it is clear and understandable or not. Also, this study assumes that EE is an enabler for IPA to be adopted for e-shopping.

H2: EE has a positive influence on BI to use IPA for e-shopping.

3.2.4 Facilitating Conditions

Facilitating Conditions are considered as "the degree to which an individual believes that the organization and technical infrastructure are intended to support the use of the system" [30]. Those conditions can be the Internet, the ability to possess an IPA, system usability guidelines, and system developers' support. Internet services influence the implementation of B2C e-commerce adoption in Saudi Arabia [40], and the availability of IPA applications to serve shopping activities are correlated with the Internet connection. It has been suggested that "perceived value is not only derived from the smart speaker output (information relevance), but from the availability and quality of third-party service providers" [33].

The more precise the product query was, the higher users' satisfaction with the results will be [41]. Therefore, it is important to inform users of how to make a shopping query. This can be supported by suggesting some query statements, giving tips on query keywords, IPA telling the user what it can serve in conversational commerce...etc. Facilitating users by giving user guidance for e-shopping could influence the behavioral intention to be adopted. As

a consequence, this study assumes that the more the IPA provide facilitating conditions the more the users intention to adopt the technology.

H3: FC has a positive influence on BI to use IPA for e-shopping.

3.2.5 Age, Gender and Previous Experience

Venkatesh [30] suggests that prior experience will be notable in EE and FC on the individual beliefs, gender on PE and EE, and eventually age on all UTAUT main predictors. Regarding Saudi's cultural context, previous studies indicated that experience is an important factor that affects their beliefs. It has been considered a predictor of e-commerce adoption in Saudi Arabia including demographic and cultural factors, age and gender [42]. Their study data demonstrated age, gender and computer proficiency varied significantly among the categories, and high-frequency users were young people, with a comparatively higher percentage of women with superior skills in shopping online.

Regular smart speaker users in previous studies [33], [43] have been found more likely to use their device to engage with online shopping. Users who are more experienced in shopping online tend to have less negative behavior against voice commerce [41]. Moreover, prior experience with an IPA has a direct effect on customer experience performance [44] which is been defined as a holistic concept that characterizes customers' cognitive, emotional, behavioral, sensory, and social responses to the service delivery process. Performance expectancy had a strong effect among male users more than on females who participated in the study [39]. In this regard, the previous experience could be influential in the context of this study. As a consequence of previous insights, this study assumes that previous experience, age group and gender are moderate factors that affect the BI of using IPA for e-shopping indirectly.

M1: Age is a moderate factor that affects PE, EE, FC and VA in regard to the IB of IPA adoption for e-shopping.

M2: Gender is a moderate factor that affects PE and EE regarding the IB of IPA adoption for e-shopping.

M3: Previous Experience is a moderate factor that affects EE and FC in regard to the IB of IPA adoption for e-shopping.

3.2.6 Information Relevance

As a technology that can provide information for shopping purposes, the information should be relevant to the searched topic to accomplish the desired task. Information relevance is a construct of information system quality [45], [46]. Information quality benefits users who want to obtain useful information and get advice on a particular topic [45]. It could be a waste of time and effort for users to read useless search results. IPA supports some searching features and can represent some local businesses,

research results demonstrated that consumers have a positive behavior toward using a voice assistant for their decision-making processes [1]. According to Hsu and Lin [33], information quality and perceived complementarity significantly affect utilitarian benefits and hedonic benefits for smart speaker use. Successful recognition of a user's voice commands will bring clear value to the user, thereby enhancing the user's perception of the utilitarian and hedonic benefits of device use [33]. Users will rate IPAs primarily based on how well they support users find the right product, this means smart software should make the right product recommendations and provide the required information based on the users' input [39]. The lack of product offers, and comparisons provided by an IPA was found to be a negative impact on adopting voice commerce [41]. The researcher in the study [47] Acknowledges the importance of the trendiness, accurate, useful and comprehensive information for online shopping. Users' participants in the study [41] explained that the more precise the product query was, the higher their satisfaction with the results will be. This shows the possibility of the existence of the correlation between the accuracy of the information provided by an IPA with adopting it for online shopping. Therefore, this study assumes that information relevance reinforces the influence of PE on BI, where IR is referred to users' perception of whether the information is valuable and meets their needs.

H4: IR has a positive influence on PE of using IPA for e-shopping.

3.2.7 Perceived Security

Perceived security can be defined as "The degree to which users believe in the security of a particular service"[48]. It concerns the safety feelings toward their personal information. In order to provide tailored actions and quality improvement of the information system to best meet users' needs, the IPA system needs to collect information and data from users to improve the capabilities of the underlying artificial intelligence algorithms [33]. Such information can be users' preference for products, location, search history and payment transactions. Accordingly, an essential requirement for the supporters of the system is to ensure private information and data be secured safely. Security issues could be one of the main considerations that hinder consumers from accepting the technology. Therefore, many studies have investigated the influence of perceived security on the adoption of software systems [27]. Even in the context of Saudis' mobile commerce adoption, it has been found perceived security has a significant impact on the continued intention to use the technology [35] Furthermore, it has been stated that security influences perceived usefulness to a great extent in adopting a voice recognition-based smart speaker [14]. A study [33] suggested including perceived security while examining

voice shopper intention for a better understanding of the use of smart speakers. It has been found that trusting an IPA influence how the voice shoppers perceive the technology [44]. In addition, trust has a direct effect on customer experience performance [44]. Thence, this study examines whether the perceived security affects the performance expectancy of using the IPA for online shopping.

H5: PS affects PE positively when using IPA for e-shopping.

3.2.8 Visual Attraction

The current study defines visual attraction as to what extent the user is attracted to the user interface of an IPA (such as colors, boxes, menus and so on) in regard to shopping activities results. Different media can be displayed as search results of products as photos, voice and textual descriptions, and maps indicating business/store destinations. The authors in the study [13] found IPA users are enjoying its interface appearance, and this promotes the idea of the user's being influenced by visual attractiveness while using the technology for online shopping. A study has pointed to the consideration of enhancing IPA device design and its user interface to enhance physical attraction [16]. A systematic survey [49] stated that the intelligent virtual agent's physicality and its identities can have an impact on the users' behavior and perception of the agent. Moreover, Yuan & Dennis [50] showed that displaying a product in an anthropomorphized form influenced customers' decisions. Previous statements reinforce the assumption that a relationship exists between VA to BI to adopt IPA for shopping online. As mentioned before, the IPAs have different user interfaces as mobile applications, some are voice and text-based which can display results on the screen as text, pictures, or videos including a voice response to the query. This type of IPA should represent the results in an organized, convenient, and clear display. Some are only voice-based that can receive and respond only with voice. Other IPA represented as products can be bought as smart speakers such as Alexa which can only receive and respond with voice. This study will examine users' experience using a voice and text-based mobile application IPA. It is to be considered that the idea of using voice commands in online shopping without a visual display is still unfamiliar [34]. This study will take the opportunity to test and assumes that the Visual Attractiveness of a voice and text based mobile application IPA influences the BI in a positive manner.

H6: VA of IPA positively affects users BI to use IPA for e-shopping.

4. Methodology

The present study intends to use a hypothetico-deductive approach conducted with an experimental user

evaluation and quantitative approach to collect and analyze the data for testing the hypotheses.

4.1 The Sample and Data Collection

This research used a simple random sampling process, which means that each person in the population has a probability of being sampled [51]. The study focuses on young adults and old people sampling units of both genders from Saudi Arabia. There was no restriction on geographic regions within Saudi Arabia.

Using the sample size formula, within a confidence level of 95%, the margin of error of 6.5% and the population proportion of young Saudis and older people 69% [24] among 34.08 million [23], the sample size should be 195 or more.

The experiment and data collection were collected over two months. The average time spent for the user experience and the questionnaire was 20 minutes. A total of 214 participants volunteered in the study, table (1) and (2) shows the sample groups and their demographic information.

Table 1: Demographic information.

Factor		N (%)
Gender	Male	36(16.8%)
	Female	178(83.2%)
Age	18 years or less	13(6.1%)
	19-39	138(64.5%)
	40-50	37(17.3%)
	Above 50	26(12.1%)
Education	General education (intermediate or High school)	37(17.3%)
	High education (diploma, bachelor's, master's or doctorate)	177(82.7%)

4.2 The Procedure

This study applied an experimental evaluation through user participation [52] to test the hypothesis determined and the data will be analyzed statistically. Furthermore, the evaluation interaction scenario was designed by using user-centered design activities (UCD)[53], [54] with the goal to generate a sufficient online shopping experience to testify the hypothesis. The core UCD activities include the understanding and specifying the context of use, specifying user requirements, designing solutions and then evaluating the designs. Under the current study context, understanding and specifying the context of use is about knowing who the IPA users are and what environment of use, and what kind of tasks the user will use the IPA for. Specifying users' requirements is to determine the success criteria of user experience for using

the IPA for shopping in terms of user tasks, and to determine the design guidelines and constraints, for example, how much time a user takes to accomplish a task, what language users prefer to use to do the task, do both languages (Arabic and English) have the same capabilities in answering users shopping query, and what operating systems need to be considered. The solution which has been designed consists of the 4 categories of scenario steps with a total of 15 steps as follow:

- Product search tasks (contains 7 steps).
- Tasks to search for information about a product (contains 4 steps).
- Request shopping guidance from the Assistant (contains 2 steps).
- helpful features support users shopping (set a reminder to purchase, manage and save favorites).

Table 2: Previous experience and mobile information.

Factor		N (%)	
Previous Experience	I have experience in using intelligent personal assistants for different purposes in my daily life. (e.g. Siri, Google assistant, Cortana, Alexa).	No	47(22%)
		Yes	167(78%)
	I depend on intelligent personal assistants in different purposes in my daily life (e.g. calendar, weather forecast, etc....).	No	138(64.5%)
		Yes	76(35.5%)
I have experience in shopping online through a mobile applications or websites.	No	11(5.1%)	
	Yes	203(94.9%)	
Mobile Device Information	The device operating system used in the evaluation.	Android	47(22%)
		IOS	165(77.1%)
		Other	2(0.9%)
	The intelligent personal assistant's language used in the evaluation.	Arabic	97(45.3%)
		English	39(18.2%)
		Both	78(36.4%)

A pilot experiment was held on 6 random volunteers to test the developed scenario of user interaction with the IPA within different smartphone operating systems and with 2 languages (Arabic and English). Their answers are not included in the questionnaire. The experiment procedure was done remotely through online sessions. Video conferencing applications have been used as ZOOM and Google Duo. The participants heard the instructors' voice, and the steps have been presented and explained through the screen which appeared to the participants. Then the

instructor asked the participants to fill out a questionnaire depending on the experience they had.

4.3 The Research Instruments

This study used Google’s assistant application to represent the IPA interface and for the participants to engage with. This assistant relies on the internet connection to work, and it was chosen to be used because it is compatible with different operating systems and available in most mobile devices application stores. Moreover, the available functionalities of this application are suitable to aid the experiment in generating user experience.

After the user experience was finished, the instructor provided an online questionnaire to the participants and collected the answers using Google Forms due to its ease of use and mobile-friendly interface. According to Bougie and Sekaran [66], the administered questionnaire is an advantageous tool in a way that it can establish rapport with the respondents, provides clarification sought by respondents on the spot, and collect the questionnaire immediately. Questionnaire items have been adapted from the previous studies [13], [14], [30], [36], [38], [45], [55]–[58] and been modified for the context of the study, then it has been reviewed by 4 academic reviewers before being used. It consists of 21 close-ended questionnaire items to measure (Performance Expectancy (4 items), Effort Expectancy (4 items), Facilitating Conditions (3 items), Information Relevance (2 items), Perceived Security (3 items), Visual Attraction (3 items), Behavioral intention to use IPA (2 items)).The participants answered the questions using the 5-Likert scale (strongly agree, agree, neutral, don’t agree and strongly don’t agree).

5. The Analysis

To analyze the data that have been collected, the study used the structural equation modeling (SEM) method via the Smart-PLS version 2.0.The SEM was conducted using two stages as follows:

First, the measurement model (or outer model). The purpose of this stage is to evaluate the model using confirmatory factor analysis (CFA) to achieve the best model fit. CFA assesses the fit of observed data and a theoretical model that specifies the hypothesized causal relations [58]. It involves creating a path model, factor loading (FL) for each item must be over the recommended value (FL>0.70), Composite reliability (CR), Cronbach alpha should be > 0.71, and Average Variance Extracted (AVE) should be > 0.50 [60]. Discriminant validity is approved when each variable shares more variance with its block of items with another variable, it is approved when $\sqrt{AVE} \geq 0.5$ and exceeded the highest values of Pearson correlation (r) in the matrix [60], [61].

Second, structural modeling (or inner model). In this stage the relationships of the variables are tested based on the theoretical model and hypotheses, it is presented using the value of β =Coefficient path. T=T-statistic and Square= R^2 [60].

The moderation hypotheses were tested using Moderation Multiple Regression (MMR) using SPSS software. MMR is a widely used technique to test a variable affection on the direction and/or strength of the relationship between an independent variable and a dependent [62].

5.1 The Results

The factor loading (FL) of all items results is represented in table (3) and exceeds the minimum value of (FL>0.70), except for item PS2=0.112. Therefore, item PS2 is eliminated from the model and has not been considered in the study.

Table 3: Factor loading

	Item	BI	EE	FC	IR	PE	PS	VA
BI	BI1	0.94	0.47	0.40	0.47	0.49	0.33	0.48
	BI2	0.93	0.42	0.37	0.35	0.43	0.29	0.48
EE	EE1	0.39	0.81	0.44	0.53	0.65	0.35	0.43
	EE2	0.30	0.75	0.41	0.59	0.60	0.36	0.40
	EE3	0.28	0.74	0.50	0.40	0.39	0.28	0.39
	EE4	0.47	0.82	0.44	0.49	0.47	0.30	0.35
FC	FC1	0.35	0.49	0.80	0.40	0.40	0.24	0.35
	FC2	0.28	0.30	0.71	0.30	0.22	0.07	0.28
	FC3	0.31	0.49	0.78	0.55	0.52	0.19	0.43
IR	IR1	0.39	0.57	0.48	0.91	0.62	0.25	0.45
	IR2	0.42	0.59	0.51	0.90	0.58	0.25	0.51
PE	PE1	0.44	0.60	0.43	0.59	0.86	0.35	0.31
	PE2	0.38	0.58	0.34	0.52	0.84	0.40	0.29
	PE3	0.41	0.48	0.41	0.46	0.76	0.29	0.32
	PE4	0.39	0.57	0.47	0.60	0.83	0.36	0.34
PS	PS1	0.30	0.39	0.19	0.25	0.44	0.94	0.18
	PS3	0.30	0.35	0.22	0.27	0.30	0.87	0.25
VA	VA1	0.41	0.39	0.36	0.34	0.23	0.22	0.84
	VA2	0.42	0.45	0.45	0.45	0.34	0.19	0.87
	VA3	0.48	0.43	0.38	0.56	0.39	0.17	0.85

Table (4) show the value of AVE and \sqrt{AVE} are over 0.7 which ranged between 0.87(0.93) and 0.58(0.76), it exceeds the minimum value. Moreover, the composite reliability and Cronbach alpha are acceptable (CR and $\alpha > 0.71$). In order to approve the discriminate validity, the lowest square root of AVE (0.76) was higher than the highest correlation (0.64). Overall conclusion, the model achieved a good model fit.

Table 4: AVE, \sqrt{AVE} , CR, α , R^2 and correlation between variables (n=227)

Construct	Mean ± Sd	(AVE)(√AVE)	CR	α	R ²	IB	EE	FC	IR	PS	PE	VA
IB	3.75±0.85	0.87(0.93)	0.93	0.86	0.37	1.00						
EE	3.82±0.74	0.61(0.78)	0.86	0.79	NA	0.48**	1.00					
FC	3.96±0.63	0.58(0.76)	0.81	0.65	NA	0.41**	0.57**	1.00				
IR	4.07±0.67	0.82(0.91)	0.90	0.78	NA	0.44**	0.64**	0.55**	1.00			
PS	3.84±0.72	0.82(0.91)	0.90	0.78	NA	0.33**	0.41**	0.23**	0.28**	1.00		
PE	3.45±0.94	0.68(0.82)	0.90	0.84	0.50	0.49**	0.68**	0.50**	0.66**	0.43**	1.00	
VA	3.95±0.67	0.73(0.85)	0.89	0.82	NA	0.51**	0.50**	0.47**	0.53**	0.23**	0.38**	1.00

***p*<0.05

Table 5: Hypothesis Results

H	Path	β	t	Remarks
H1	PE has a positive influence on BI to use IPA for e-shopping.	0.26	2.52	Supported
H2	EE has a positive influence on BI to use IPA for e-shopping.	0.10	0.77	Unsupported
H3	FC has a positive influence on BI to use IPA for e-shopping.	0.07	0.65	Unsupported
H4	IR has a positive influence on PE of using IPA for e-shopping.	0.59	7.59	Supported
H5	PS affects PE positively when using IPA for e-shopping.	0.26	3.19	Supported
H6	VA of IPA positively affects users BI to use IPA for e-shopping.	0.33	3.12	Supported

Keys : β=Coefficient path.SE=standard error. T=T-statistic, ***p*<0.05

Table 6: Moderation multiple regressions.

Moderator	Predictor variables	β	SE-b	Beta	t	p	
The moderation role of gender between PE and using IPA for e-shopping	(Constant)	1.11	0.35		3.14	0.00**	R ² =0.26; Adjusted R ² =0.25. F=24.29**
	PE	0.55	0.07	0.48	8.09	0.00**	
	Gender	0.06	0.09	0.05	1.14	0.11	
	PE*Gender	-0.03	0.05	-0.03	-0.52	0.60	
The moderation role of age between PE and using IPA for e-shopping	(Constant)	1.64	0.29		5.73	0.00**	R ² =0.24; Adjusted R ² =0.23. F=22.21**
	PE	0.58	0.07	0.51	7.81	0.00**	
	Age	-0.04	0.07	-0.04	-0.59	0.55	
	PE*Age	0.03	0.06	0.03	0.48	0.63	
The moderation role of age between VA and using IPA for e-shopping	(Constant)	1.05	0.33		3.20	0.00	R ² =0.27; Adjusted R ² =0.26. F=25.94**
	VA	0.64	0.07	0.50	8.48	0.00	
	Age	0.09	0.07	0.08	1.33	0.18	
	VA*Age	-0.05	0.05	-0.06	-1.01	0.32	

Note: BI to Use IPA for e-shopping is the dependent variable, β is the unstandardized coefficients, SE-b is the Standard error, **Significant at .05 level.

Table (5) represents the results of structural equation modeling approval of all the structural paths except for the influence of the Effort Expectancy ($\beta=0.10, t=0.77, p>0.05$) and Facilitating Conditions ($\beta=0.07, t=0.65, p>0.05$). The analysis supports the positive relationship of the Performance Expectancy ($\beta=0.26, t=2.52, p<0.05$), and Visual Attraction ($\beta=0.33, t=3.12, p<0.05$) on the Behavioral intention to adopt IPA for e-shopping. Moreover, the Information Relevance ($\beta=0.59, t=7.59, p<0.05$) and Perceived Security ($\beta=0.26, t=3.19, p<0.05$) have a significant influence on the Performance Expectancy.

To test the moderation using moderation multiple regressions, the direct significant relationship between the variables must be met, so only two direct relationships have been approved which are the relationship of the Performance Expectancy and Visual Attraction on the Behavioral Intention in using IPA for e-shopping. For that reason, only three moderation hypotheses were tested. The moderation role of gender between the Performance Expectancy and Behavioral Intention to use IPA for e-shopping (PE*age), the moderation role of age between Visual Attraction and Behavioral Intention to use IPA for e-shopping (VA*age), and the moderation role of Gender between Performance Expectancy and Behavioral Intention to use IPA for e-shopping (PE*Gender). The results show gender did not moderate the relationship

between Performance Expectancy and Behavioral Intention to use IPA for e-shopping ($\beta=-0.03$, $t=-0.52$, $p>0.05=0.6$). Neither age did not moderate the Performance Expectancy ($\beta=0.03$, $t=0.48$, $p>0.05=0.6$), and Visual Attraction ($\beta=-0.05$, $t=-1.01$, $p>0.05=0.32$). Concluding that none of the three moderation hypotheses has been supported. See table (6).

5.2 Discussion

There is clear support for several hypotheses in this study. Table (4) shows that the constructs' correlation was significant and positive. They ranged between ($r=0.64$, $p<0.05$) and ($r=0.23$, $p<0.05$). Mean scores of the variables indicated a high interval level, they ranged between (4.07 ± 0.67) and (3.45 ± 0.94) which interpret the interval of the "Agree" scale measurement [63], [64]. The results show that the performance expectancy and visual attractiveness of an IPA are significant when using it for shopping online by Saudi users.

The study supports Venkatesh's statement of performance expectancy [30], which is considered the strongest predictor of the behavioral intention to use the technology. Also, it supports the findings of previous studies on the impact of performance expectancy in technology adoption such as [15], [36], [38], and on technology adoption in Saudi Arabia [42]. In addition to the latest studies on voice commerce adoption as [33], it stated that voice recognition capability is the most important smart speaker system function. According to [34], [39], there are differences between Germany, the US and the UK in the acceptance of voice commerce applications, however, performance expectancy had an impact in all three countries and had the greatest impact.

Visual attractiveness has a significant effect on users' behavioral intention. It is also has been stated by a prior study [49]. However, effort expectancy and facilitating conditions did not have a significant relationship with the behavioral intention to adopt IPA for e-shopping where the regression result argued in supporting Venkatesh statements on effort expectancy and facilitating conditions significance in technology adoption [30]. Although facilitating conditions had an insignificant effect on BI, the mean score (3.96 ± 0.63) of FC indicates a high degree to which the participants agree on the obtainability and availability of an IPA and the internet service. 89.9% of the participants agreed to the statement item FC2 "I have the resources necessary (e.g. good Internet connection, ability to have an IPA) to use Intelligent personal assistant for online shopping." which probably indicates that an adequate Internet connection is available for using IPA for online shopping in Saudi Arabia.

According to [65], culture and social characteristics affect adoption and usage behaviors, and Arab societies and Muslim communities are different compared to others. Previous technology adoption studies in Saudi Arabia as

[35] has found that ease of use didn't have a significant effect on the continued intention to adopt the technology, and the easy service features on an e-commerce website which is named as the service quality as a construct in [42] study did not have a significant effect on e-commerce adoption in Saudi Arabia as well. The explanation for this insignificant effect may be the notion of culture and social characteristics effects, and more valued in the usefulness and the performance expectancy of the technology. Each country has different circumstances [34], among Germany, the US and the UK, effort expectancy has an influence only in the US [39]. Another explanation is that communicating with an IPA using voice or text doesn't cause a lot of effort; therefore, the communication results and information relevancy from IPA are more important.

The finding of the study also shows that performance expectancy is enhanced by information relevance and perceived security significantly. Information relevance influence can be demonstrated in the idea for IPA to enhance decision-making processes for shopping [1]. Information should be more relevant to the local society. According to [41], due to the limit results that the conversational commerce produces within the IPAs and not always match users' expectations and preferences is significantly affecting the adoption of the technology in a negative way. Therefore, e-commerce organizations and firms should develop the research results in regard to the IPA to represent information with more relevant pictures and voice recognition answers to users' queries. It has been stated that the quality of the information provided by a smart speaker after successfully recognizing a user's voice command will bring significant value to the user, thereby enhancing the user's perception of the utilitarian and hedonic benefits of device usage [33]. The result is in line with voice commerce findings as [33], its results show an indirect effect of information quality on stickiness. As a result, users who feel that their smart speakers are not delivering high-quality information output are less likely to see the device as beneficial to their lives and therefore less likely to continue using it. The information relevance significant relationship with the behavior intention is also in line with social commerce, where five determinants have been found to affect the perceived social media marketing [47] including Interactivity, Informativeness, Word of Mouth, Trendiness, and Personalization. Pointing to the importance of the trendiness, accurate, useful, and comprehensive information provided for shopping online.

In regard to the safety feelings toward their personal information, only half of the participants agreed on the items' statements PS1 "I think no one else can see and use my personal information stored in the Intelligent Personal Assistant", and PS3 "I think my personal information in the Intelligent Personal Assistant will not be manipulated by other people". Concluding with the lowest mean

interval score (3.84 ± 0.72). Indicating that it is important to develop and maintain the security and privacy of IPA users' information to build and conserve trust and positive perception of the technology. The positive indirect effect of perceived security toward the behavioral intention agrees with a previous study [14] assumption regarding IPA trust. In addition, the result is in line with the recent studies on voice commerce where [44] found that trusting an IPA has a direct effect on customer Experience performance and an indirect relationship toward voice shoppers' perception.

Regarding whether there is a tendency of Saudi users to Adopt IPA for e-shopping, based on the findings, the mean score of the Behavioral Intention (3.75 ± 0.85) shows that Saudi users are tended to use IPA for online shopping in their daily life. Therefore, IPA should be seized and invested in e-commerce local businesses. It is an opportunity to adopt an innovative technology [7]. Moreover, this study shows that the hypothesized relationships of age and gender did not moderate any of the influential factors revealed. This indicated that female and male participants showed no significant difference in user behavior towards the adoption of IPA. This implies that the result was not in harmony with previous research in the context of e-commerce adoption in Saudi Arabia [42], and the recent studies of voice commerce adoption [39]. The reason behind this could be associated with the fact that the majority of the sample in this study are females and the age group most are between 19 to 39.

6. Conclusion

This study tended to answer the question: (What enabling factors do influence Saudis when adopting IPA for searching or buying products over the Internet?). To answer the research question, the study objectives were to develop a theoretical framework that represents the hypothesized relationship between factors with the use of the UTAUT model and extended with more variables derived from the previous literature review. Then, performed an experimental user experience method to test the hypotheses. Next was to analyze and measure the data collected statistically using the SEM and MMR analysis methods. Data were collected through an adapted and reliable questionnaire. Lastly, was to state or describe relationships between the factors and IPA adoption.

The main result shows that performance expectancy and visual attractiveness have a positive influence on the behavioral intention to adopt an IPA for e-shopping in Saudi Arabia. However, effort expectancy and facilitating conditions were not. In addition, this study shows that performance expectancy influence did not been affected by age and gender, and visual attractiveness did not been affected by age as well. Moreover, preserved security and related information have a significant influence on

performance expectancy. The present study also revealed that there is a tendency of Saudi users to Adopt IPA for e-shopping in their daily life.

6.1 Limitations and Future Work

This study has the following limitations. First, the user experience scenario steps action results (user shopping query results) were based on general information search and purchasing information search. Currently, IPAs can give brief information but could not address complicated issues. Future studies could find different tools for user experience evaluation to testify to the variables' influence on behavioral intentions. Secondly, users did not been demanded to carry out the process of buying products during the experiment. Thirdly, the study only revealed 37% of the influence made by independent variables on the behavior intention. More independent variables need to be explored and tested empirically. Moreover, the experimental procedure was done remotely through online sessions during covid 19-pandemic, so the instructor could not observe participants' behavior, suggesting that researchers could use mixed methods to test and explore more influential variables in advance. Qualitative research can be used for future research to expose any distinct significant predictors and to obtain a deeper understanding from consumers' points of view. Furthermore, this study focused on the Saudis as a user sample. To generalize the results, the model should be tested on different user samples. Lastly, future research could add other potential factors into the proposed model to test the influence constructs of users' intention to adopt IPA for e-shopping. Several previous studies indicated the significant effect of social influence as [14], [38]. Therefore, the study recommends replicating the study with the inclusion of the Social Influence for future studies with other hedonic and emotional factors. These factors can be, but are not limited to, enjoyment, satisfaction, and Parasocial relationship [16].

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